PHILOSOPHICAL

QUESTIONS.

BRITISH MUSEUM

Hartley (R.)

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PHILOSOPHICAL QUESTIONS,

SELECTED

FOR THE USE OF THE

UPPER CLASSES

IN

BERKHAMSTED SCHOOL;

AND

Extracted chiefly from Lectures introductory to the Doctrine of Matter in general.

Mundus codex eſt Dei, in quo jugiter legere debemus.
Bernard. Serm.
Philoſophia eſt catechiſmus ad fidem. *Cyril.* 1. *contr. Jul.*

BERKHAMSTED:
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1797.

BRITISH MUSEUM

TO THE

Rev. JOHN DUPRÉ, D. D.

HEAD MASTER OF BERKHAMSTED SCHOOL.

Respected Sir,

Your *ardent deſire to promote the improvement of your Pupils, leads you readily to adopt and purſue any means which may be conducive to that eſſential object: and as, from this laudable principle, you have undertaken to defray the expences of* *printing the following Queſtions, I think it my duty, thus publickly to declare, how much I am,*

Reſpected Sir,

Your obliged,

humble ſervant,

R. Hartley,
Teacher of Mathematics in Berkhamſted School.

PREFACE.

The want of attention in the hearers is undoubtedly one of the greateſt obſtacles which a Teacher experiences in conveying inſtruction by Lectures. To ſurmount this, after every Lecture, I required my Pupils to give an explanation of the ſubſtance of what had been delivered; and their reſpective degrees of attention have been diſcovered, in proportion to the ability evinced by them in reſolving thoſe queſtions, which ariſe naturally from the ſubject. This plan, upon trial, has been found fully to anſwer every expectation. But many Gentlemen, who have attended the Lectures in this School, conceived that, if they had the queſtions printed, they could at any future time be capable of recollecting the greateſt part, eſpecially if a ſmall degree of information were given on the oppoſite page. This ſuggeſtion I mentioned to Dr. Dupré, who readily conſented that I ſhould give to his School the following ſheets, in the form and manner which appeared beſt calculated to unite the purpoſes of the Lecturer, with eaſe, pleaſure, emulation, and effect to his Scholars.

MANY perſons of conſiderable ſcientific attainments, having been made acquainted by me with the plan which I purſued in my department as teacher of Mathematics in this School, have expreſſed their approbation of it; and hinted that it might be equally uſeful in other ſeminaries: and their flattering teſtimony has been the reaſon why a few more copies have been printed than what were immediately neceſſary to anſwer the original purpoſe. Should theſe fall into the hands of perſons who can derive as great a benefit from the plan as I have experienced, the end of publiſhing them will be completely obtained.

IT may be proper to remark in this place, that the derivations have been added for the uſe of the Junior Students. The ſtudy of the dead languages not having been the object of my purſuits, I had recourſe partly to a well known book, Martin's Philoſophical Grammar, and partly to a learned and very uſeful work lately publiſhed, Dr. Hutton's Mathematical and Philoſophical Dictionary. Information has alſo been derived from Nicholſon's Philoſophy, Keil's Aſtronomy, Adams' and Ferguſon's Electricity, Robertſon's Navigation, Guthrie's Geographical Grammar, Harris and Fenning on the Globes, Clare's Motion of Fluids, &c. &c. &c. Theſe books are here mentioned, becauſe a careful peruſal of them will enable the private ſtudent to give a copious and ſatisfactory anſwer to the queſtions contained in this little compilation; and that with a very great degree of improvement and pleaſure, if he has a ſmall philoſophical apparatus; ſuch, for inſtance, as the Terreſtrial and Celeſtial Globes, the new improved Magic Lantern for ſhewing the Motions of Planets, Eclipſes, &c. Tellurian, Planetarium, Electrical Machine, Air Pump, Glaſs Priſms, Microſcope, and Teleſcope.

I THINK it my duty to declare that I am ſolely reſponſible for any miſtakes or errors which may occur in this ſmall book: and I ſhall hold myſelf infinitely obliged to thoſe who ſhall point them out, and ſuggeſt any advice to improve the plan or execution of the preſent work, ſhould it ever reach a ſecond edition.

R. H.

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1. Φιλια σοφια.

2.

3. Planetary ſyſtem, tranſmigration, 47 prop. of Euclid, multiplication table.

4. Academics, moſaic, mundane, ſupramundane, immortality.

5. Peripatetics, logic, ſubſtantial forms, Pythagorean ſyſtem, ſolid orbs.

6. Canonical, phyſical, ethical, pleaſure, pain.

PHILOSOPHICAL QUESTIONS.
&c. &c. &c.

CHAPTER I.

PHILOSOPHY IN GENERAL.

1. WHAT is Philoſophy?
2. How many different kinds of philoſophy do you enumerate?
3. What do you underſtand by the Pythagorean philoſophy?
4. What by the Platonic?
5. What by the Ariſtotelian?
6. What by the Epicurean?

7. Thinking ſubſtance, extended ſubſtance, vortex, plenum.
8. Primogenial particles, vacuum, gravity, ſolar ſyſtem, light, colours, &c.
9.
10.
11. Hermes Triſmegiſtus.
12.

13.
14.
15. Εθος.
16. Φυσις
17.

18. Diſtinguiſhing property.

19.
20.
21.
22.
23.
24.

7. What by the Carteſian?

8. What by the Newtonian?

9. What by Experimental?
10. What by Atomical or Corpuſcular?
11. What by Hermetical?
12. Are theſe all the different kinds of philoſophy?
13. Why do you not mention more?
14. How do you divide philoſophy?
15. What do you mean by Ethics?
16. What do you underſtand by Phyſics?
17. To which of theſe do you at preſent mean to apply?
18. What do you mean by the nature of things?
19. What is underſtood by the *Firſt Cauſe*?
20. What are natural or ſecundary cauſes?
21. What is the meaning of final cauſe?
22. What is matter?
23. What are the elements of natural bodies?
24. How is matter, or bodies, commonly conſidered?

25.

26.

27.

28. See the concluſion of Thomſon's Seaſons.

29.

25. How are the properties of bodies diſtinguiſhed?

26. What are their common or eſſential properties?

27. What are their ſpecific or accidental?

28. Is philoſophy of any uſe in the affairs of human life.

29. Have the modern philoſophers any advantages over the ancient?

30. Φυσις λόγος.

31.

32. Σωματα λόγος.

33. Κοσμος λόγος, κοσμος γραφὴ, ουρανος λόγος.

34. Ἀὴρ λόγος.

35. Γῆ λόγος.

36.

37. Ἥλιος γραφὴ, σελήνη γραφὴ, πλαναομαι γραφὴ, κομαω γραφὴ, αστρον γραφὴ.

38.

39. Ἀηρ γραφὴ, ανεμος γραφὴ, μετεωρον γραφὴ, φαντασματα γραφὴ.

40.

41. Γῆ γραφὴ, ὕδωρ γραφὴ, φύτον γραφὴ, ζωον γραφὴ.

CHAPTER II.

SUBDIVISIONS OF PHISIOLOGY, AXIOMS, RULES, INSTRUMENTS.

30. WHAT is Phyſiology?
31. Into how many general parts is phyſiology divided?
32. What is meant by Somatology?
33. What do you underſtand by Coſmology, Coſmography, Uranology?
34. What does Aerology treat of?
35. What is underſtood by Geology?
36. What does Uranology comprehend?
37. What is meant by Heliography, Selenography, Planetography, Cometography, and Aſtrography?
38. What does Aerology comprehend?
39. What is underſtood by Aerography, Anemography, Meterography, and Phantaſmatography?
40. What does Geology comprehend?
41. What is Geography, Hydrography, Phytography, and Zoography?

42.
43. Nothing.
44. Somewhat.
45. Medium.
46. Eſſence.
47. Something from nothing.
48. Nothing from ſomething.
49. Pre-exiſtent cauſe.
50. Some other cauſe.
51. Same ſtate.
52. Every change — external.
53. Every change — proportional.
54. No more cauſes.
55.
56. Same cauſe — ſame effect.
57.
58. Same qualities — general properties.
59.
60. Experiments — hypotheſis.
61.
62. Τελεω σκοπέω — refracting — reflecting.
63. Μικρος σκοπέω.
64. Ἥλιος σκοπέω.
65. Βᾶρος μετρεω.
66. Θερμη μετρεω.

42. What is meant by an Axiom?
43. What is the firſt axiom?
44. What is the 2d?
45. What is the 3d?
46. What is the 4th?
47. What is the 5th?
48. What is the 6th?
49. What is the 7th?
50. What is the 8th?
51. What is the 9th?
52. What is the 10th?
53. What is the laſt axiom?
54. What is the firſt rule of philoſophizing?
55. How do you illuſtrate it?
56. What is the 2d rule?
57. Explain this rule?
58. What is the 3d rule?
59. Give an explanation?
60. What is the 4th rule?
61. Explain this rule?
62. What do you underſtand by Teleſcope?
63. What is a Microſcope?
64. What is an Helioſcope?
65. What is a Barometer?
66. What is a Thermometer?

67. Ανεμος σκοπέω.
68. Ὕγρος σκοπέω.
69. Ὕδωρ στατικὴ.
70. Διόπτομαι.
71. Κατοπτομαι.
72. Πνεῦμα.
73. Ear.

67. What is an Anemoſcope?
68. What is an Hygroſcope?
69. What is the Hydroſtatic balance?
70. What is a Dioptric inſtrument?
71. What is a Catoptric inſtrument?
72. What is a Pneumatic engine?
73. What is an Orrery?

74. Extenſion, diviſibility, ſolidity, figurability, mobility.

75.

76.

77.

78.

79.

80.

81.

82.

83. 200 by 200 by 50.

84. 125000.

CHAPTER III.

SOMATICS, THE ESSENTIAL PROPERTIES OF MATTER, MECHANICAL POWERS, LAWS OF MOTION.

74. WHAT are the common, general, or eſſential properties of matter?

75. What do you call the elements of natural bodies?

76. What is meant by extenſion of matter?

77. How do you conceive of the dimenſions of bodies?

78. How many degrees of magnitude of bodies are there?

79. How are things ſaid to be great or ſmall?

80. What is the diviſibility of matter?

81. How is infinite diviſibility mathematically proved?

82. What is the ductility of matter?

83. How many viſible parts may be made to appear in one grain of gold?

84. How many ſkins of gold make one inch in thickneſs?

85. ·000029.

86.
87.
88.
89.
90.
91.
92.

93.

94.
95.
96.
97.
98.

99.
100.
101. Velocity by weight or denſity.
102.

103.
104.

85. What is the length of a microſcopic animalcule?
86. What is the ſolidity of a body?
87. Is this property the ſame in liquids?
88. What is the figurability of bodies?
89. What is meant by the mobility of bodies?
90. What is meant by motion?
91. How does the eye perceive motion?
92. How may abſolute motion be perceptible reſt?
93. How may curvilinear motion appear rectilinear?
94. What is meant by angular motion?
95. How is motion diſtinguiſhed?
96. What is abſolute motion?
97. What is relative motion?
98. How may a perſon be abſolutely in motion and yet relatively at reſt?
99. What is velocity or celerity?
100. What is momentum?
101. How is the momentum found?
102. What is the difference between velocity and momentum?
103. What is the direction of motion?
104. What is ſimple motion?

105.

106. Lever, balance, pulley, axis in peritrochio, inclined plane, wedge, ſcrew.

107. Pincers, ſheers, ſnuffers.

108. Cutting knives, doors, bellows, oars, rudder.

109. Spring ſheers, tongs.

110. Power by diſtance equal weight by diſtance.

111.

112.

113.

114.

115.

116. *P* by *R* equal *W* by *r*.

117. In the ratio of *r* by *r* by *r*, &c. to *R* by *R* by *R*, &c.

118.

119.

120. The number of ropes, (that where the power is applied excepted.)

121.

122. As length to perpendicular height.

105. What is compound motion?
106. What are the ſeven mechanical powers?

107. What is a lever of the firſt kind?
108. What is a lever of the ſecond kind?

109. What is a lever of the third kind?
110. How is the power gained by a lever computed?
111. What is the uſe of a balance?
112. How is a deceitful balance detected?
113. What is the ſteelyard?
114. What is the bent lever balance?
115. What is the axis in peritrochio?
116. How is the power of this machine calculated?
117. In a combination of theſe, how is the power found?
118. What is the uſe of the pulley?
119. What is the trochlea or tackle?
120. How is the advantage gained by a ſyſtem of pullies known?
121. What is the inclined plain?
122. How is the power of it found?

123\.

124. As length of ſide to half breadth.

125\.

126\.

127. As diſtance from thread to thread to circumference of the lever.

128. Friction.

129\.

130\.

131\.

132\.

133\.

134\.

135. All bodies continue in their ſtate of reſt or motion, &c.

136\.

123. What is the wedge, and what may be referred to it?

124. How is the advantage gained by the ſixth power computed?

125. Is the computed power the only advantage gained by the wedge?

126. Which do you reckon as the laſt of the mechanic powers?

127. How is its advantage calculated?

128. Are the rules for finding the powers gained exact?

129. Which of theſe powers have the leaſt friction?

130. Which have the greateſt?

131. Which is in a medium?

132. How is the time loſt in proportion to the advantage gained?

133. What is the general rule for calculating the advantage gained?

134. How many general laws of motion are there?

135. What is the firſt law of motion?

136. Illuſtrate this law.

137. All change of motion is proportionate, &c.

138.

139. Action and re-action are equal and contrary, &c.

140.

137. What is the ſecond law of motion?

138. Explain this law.
139. What is the third law of motion?

140. Give an illuſtration of this law.

141. Species—per accidens.

142.
143.
144.
145.

146. Eclipſes of Jupiter's ſatelites.
147. 15)190,000,000(12,666,666 miles.

148.

149.

150.

151.

CHAPTER IV.

SPECIFIC PROPERTIES OF MATTER, LIGHT, COLOURS, SOUND.

141. WHAT properties of matter are thoſe which are called ſpecific or accidental?

142. What do you call Light?

143. What are the rays of light?

144. Is not the ſun the fountain of light?

145. Is the motion of light inſtantaneous or progreſſive?

146. How is its motion proved?

147. At what rate per minute is the velocity of light?

148. What do you call the reflexibility of light?

149. What is the angle of incidence, and what the angle of reflection?

150. How far do objects appear beyond plane ſpeculums?

151. What is meant by a Medium?

152.

153. Veſſel of water and a piece of money.

154.

155.
156.
157. Red, orange, yellow, green, blue, indigo, violet.
158.
159.

160. Dyers, &c.
161.
162.

163.
164. Air pump.
165. 1142 feet per ſecond.
166.
167.

168. Vibration.

152. What is meant by the refrangibility of light?

153. By what experiment is the refrangibility of light made viſible?

154. Give an account of the ſmallneſs of the particles of light.

155. What do you mean by Colours?

156. What is the origin of colours?

157. How many colours are there? and name them.

158. What do you call black and white?

159. Are colours innate in bodies, or only painted upon them?

160. Are colours tangible qualities?

161. What is the cauſe of Sound?

162. How is it that ſound can be heard by more than one perſon at a time?

163. What is the medium of ſound?

164. How do you prove that?

165. What is the velocity of ſound?

166. How far can ſound be heard?

167. Does the wind accelerate or retard the velocity of ſound?

168. What is a continued ſound, and how is it effected?

169.

170.

171.

172. 'Ακούω, φωνῆ.

173. Stentor.

174.

175.

176.

177.

178.

179.

180. Homogeneous.

181.

182.

169. How does a continued ſound grow weaker?

170. What is an Echo?

171. What are the principles of the whiſpering gallery?

172 What are the Acouſtics and Phonics?

173. What is the Stentorophonic tube?

174. What is the Phonocamptic object and center?

175 At what diſtance muſt the phonocamptic center be to return one ſyllable?

176. Upon what does the intenſity or remiſsneſs of ſound depend?

177. What is the cauſe of acuteneſs and gravity of ſound?

178. What is a ſimple ſound?

179. What is a compound ſound?

180. What kind of a body muſt it be to produce a ſmooth, even, and clear ſound?

181. What ſort of a body produces a rough, hoarſe, or obtuſe ſound?

182. What ſort of ſounds do you call the former of theſe?

183. Small, ſhort, tight.

184. Greater, longer, ſlacker.
185.
186.
187.
188. 1 to 1.
189. 1 to 2.
190. 2 to 3.
191.

192.

193. Muſic.

183. What ſort of a ſtring produces the acuteſt ſounds?

184. What produces the graver ſounds?

185. What is called conſonance?

186. What uniſonance?

187. What concordance and diſſonance?

188. What is the moſt perfect uniſon?

189. What is an octave?

190. What is a fifth?

191. How muſt a muſical ſtring be divided to ſound the ſeven concords?

192. Is there any agreement between a ſpectrum of colours and a muſical ſtring?

193. What remedy is uſed for the bite of the Italian ſpider, tarantula?

194.

195.

196.

197.

198. Level.

199.

200. Find for two, then that center and the third body.

201.

202.

203.

204.

CHAPTER V.

SPECIFIC PROPERTIES OF MATTER, GRAVITY AND LEVITY, ATTRACTION AND REPULSION, ELECTRICITY.

194. WHAT is Gravity?
195. What do you mean by the weight of bodies?
196. What is abſolute gravity?
197. What ſpecific gravity?
198. What is the center of gravity?
199. What is the center of gravity of two bodies?
200. How is the center of gravity of three or more bodies found?
201. How does the power of gravity act upon bodies?
202. Do all bodies deſcend with equal velocities?
203. With what velocity do bodies deſcend?
204. Why do bodies deſcend with accelerated velocity?

205.
206.

207. Reciprocally as the ſquares of the diſtances from the center.
208. Parabola.
209.

210.

211.

212.
213.

214. Two-thirds from center of motion.
215. Ditto
216.

217. Loadſtone attracts, ſteel gravitates.

218.
219.
220.

205. Do bodies gravitate towards each other?

206. Do bodies loſe weight by being removed from their center of gravity?

207. How is the weight of bodies found when removed from the center of gravity?

208. What curve does a projectile deſcribe?

209. What elevation gives the greateſt horizontal random?

210. Do projectiles deſcend with the ſame velocity with which they aſcend?

211. How do bodies deſcend down inclined planes.

212. What is a Chronometer?

213. How do you prove a pendulum to be a chronometer?

214. What is the center of Oſcillation?

215. What is the center of Percuſſion?

216. What muſt be the length of a pendulum to vibrate ſeconds.

217. What is the diſtinction between gravity and attraction?

218. What is meant by Levity?

219. What is Attraction of Coheſion?

220. Where is this attraction the ſtrongeſt?

221.

222.

223.

224. Ebulitions, fuſions, diſſolutions, cryſtallization.

225.
226.
227.
228.

229.

230.

231. Ηλεκτρον.
232.

233.

234. Conductors.
235. Non-conductors.

221. What is it that prevents bodies from diſſolving into powder?

222. Why do liquids riſe in bread, ſugar, ſponge? &c.

223. Are the ſurfaces of liquids perfectly level?

224. If two bodies of different attractive powers be mixed, what will be the reſult?

225. What is meant by Repulſion?

226. Where does the repelling power begin?

227. Why will not oil mix with water?

228. Why will a dry needle ſwim upon water?

229. How is it that flies can walk upon water without wetting their feet?

230. How is attraction and repulſion exhibited very viſibly?

231. What do you mean by Electricity?

232. How long has electrical attraction been known?

233. Are all bodies endued with electric matter?

234. What are non-electric bodies?

235. What are electrics?

236. Metals, living animals, water, moiſt wood.
237. Glaſs, wax, roſin, dry glue, baked wood, ſilk.
238.
239.
240.
241.
242.
243.
244.
245.
246.
247.
248. No free paſſage of an electric.
249.
250.
251. Ηλεκτρον μετρέω.
252.
253. Diſcovered at Leyden.
254. Repulſion.

236. Enumerate ſome non-electrics.

237. Mention ſome electrics.

238. What is the natural quantity of electrical fire in a body?
239. What will diſturb its dormant ſtate?
240. What is the great ſource of electric fire?
241. How is a body ſaid to be electrified poſitively, or plus?
242. How negatively, or minus?
243. What is an electrical machine?
244. What is the electric?
245. What is the cuſhion?
246. What is the prime conductor?
247. What do you mean by inſulated?
248. Why is the conductor inſulated?
249. Why is the cuſhion inſulated?
250. What is the diſcharger?
251. What is an Electrometer?
252. What is the uſe of the inſulated ſtool?
253. What is the Leyden phial?
254. Why do the fibres of an electrified feather expand?

255. Conductors,

256.

257.

258.

259. Inſulated.

260.

261.

262. As water forced by a fountain through a bended tube.

263.

264.

265. Shorteſt.

266.

255. Why do pieces of paper dance between the metal plates?

256. Why do balls of pith dance in an electrified tumbler?

257. How do you account for bells ringing by electricity?

258. How do you multiply the electrical ſpark?

259. How may a perſon be made to attract light bodies?

260. How do you fire ſpirits of wine by electricity?

261. How do you vary this experiment by a hot poker?

262. How do you account for the turning of the electrified fly of a jack?

263. How do you diſcharge the Leyden phial?

264. How do you diſcharge two phials by the electrical ſpider?

265. What is the direction of the electric matter in the diſcharge of the Leyden phial?

266. How do you make a hole through paper by a diſcharge?

267.

268.

269.

270.

271.

272.

273.

267. How do you give the electrical ſhock to one perſon?

268. How do you give the ſhock to many at the ſame time?

269. What is the velocity of electrical fire?

270. How do you ſtrike fire out of water?

271. How do you prove the influence of conductors for buildings?

272. What is the Electrophorus?

273. How do you diſcharge the apparatus for proving the exiſtence of poſitive and negative electricity.

274. Diaphanous.
275. Multitude of reflexions.
276. Thickneſs.
277. Thinneſs.
278.

279. Mutual attraction.
280. Little reſiſtance.
281.

282.
283.
284.

285. Stiffneſs.
286.
287.
288. Motion.

CHAPTER VI.

SPECIFIC PROPERTIES OF MATTER, TRANSPARENCY, &c.

274. WHAT is Tranſparency?
275. What is Opacity?
276. What is Denſity?
277. What is Rarity?
278. By what are denſity and rarity moſt affected?
279. What is Hardneſs?
280. What is Softneſs?
281. Do not the hardneſs and ſoftneſs of bodies ariſe from rarity and denſity?
282. What is Fluidity?
283. What is Liquidity?
284. How do fluidity and liquidity differ?
285. What is Rigidity?
286. What is Flexibility?
287. What is Fixity or Conſiſtence?
288. What is Heat?

289.

290.

291.

292.

293.

294. Squares.

295.

289. What is Cold?
290. What is Humidity or Moiſture?
291. What is Siccity?
292. What is Elaſticity?
293. What are the Odours of bodies?
294. How do the odours decreaſe from the diſtance of the oderiferous center?
295. What are the Sapours of bodies?

296.
297.
298.

299. See queſtion third.
300.
301.

302.
303. Six.

304.
305.
306.
307.

308.
309.

CHAPTER VII.

COMOLOGY, SOLAR ASTRONOMY.

296. WHAT is Aſtronomy?
297. What is Solar aſtronomy?
298. What is the Solar, Copernican, or Newtonian ſyſtem?
299. Who firſt diſcovered this ſyſtem?
300. What is the Platonic ſyſtem?
301. What is the order of the planets as ſituated from the ſun?
302. What are the Fixed Stars?
303. How many are the magnitudes of diſcernible ſtars?
304. What are the teleſcopic ſtars?
305. What is a Conſtellation?
306. Which are the Seven Primary Planets?
307. How are they characterized in books of aſtronomy?
308. What are the Secondary Planets?
309. How many ſecondaries are there, and how are they ſituated?

310. Ellipſis.
311.
312.
313.
314.

315.
316. Σῶον.
317.
318.

319.

220.
321.

322.
323. Interſection?

324.
325.
326.
327. Same ſign, degree, minute, &c.

328.

310. What is the Orbit of a planet?
311. What is the Eccentricity?
312. What is the Annual Motion?
313. What is the Diurnal?
314. What is the Aphelion or Superior Apſis?
315. What is the Perihelion?
316. What is the Zodiac?
317. What is the Ecliptic?
318. What are the names of the conſtellations in the zodiac?
319. Give me their characters, as uſed by aſtronomers.
320. What are the equinoxial points?
321. What is meant by the Preceſſion of the equinoxes?
322. What are the Celeſtial Hemiſpheres?
323. What are the Nodes of a planet's orbit?
324. Which is the aſcending node?
325. Which is the deſcending?
326. How are the nodes written?
327. What is meant by Conjunctions of planets?
328. What is meant by their Oppoſitions?

329.
330.
331.

332.
333.
334.
335.
336.

337.

338. Interior, near Sol.

339. Interior, horned, evening, morning.
340. Has a ſatellite, third from Sol

341. Exterior, red, denſe atmoſphere.
342. Belts, moons.
343. Ring, moons.
344. New, moons.

329. What is the ſuperior conjunction?

330. What is the inferior?

331. What is the cauſe of an eclipſe of the ſun?

332. What of an eclipſe of the moon?

333. Why are they called Eclipſes?

334. What is the Heliocentric place?

335. What is the Geocentric place?

336. Do the planets ſhine with their own light?

337. With what light do the ſecondaries ſhine?

338. What particulars do you know of Mercury?

339. What of Venus?

340. What of the Earth, conſidered as a planet?

341. What of Mars?

342. What of Jupiter?

343. What of Saturn?

344. What of Georgium?

345.
346.
347.
348.
349.
350. Direct order of ſigns.

351.
352.
353.
354.

355. By magic lanterns.

356. Ditto.
357. Ditto.
358.

CHAPTER VIII.

TERRESTRIAL ASTRONOMY.

345. What is Terreſtrial Aſtronomy?
346. What are Geocentric Phenomena?
347. What is the direct motion of a planet?
348. What is the retrograde motion?
349. What is a ſtationary planet?
350. How does a planet move in conſequentia?
351. How in antecedentia?
352. What is the Elongation of a planet?
353. Where is a planet's greateſt elongation?
354. Is an inferior planet ever in oppoſition to the ſun?
355. Explain the direct appearance of a ſuperior planet.
356. Explain the ſtationary.
357. Explain the retrograde appearance.
358. Is a ſuperior planet ever in oppoſition to the ſun?

359.

360.

361.

362. By the Tellurian.

363.

364. Decreaſing.

365. Parallel.

366. By the Tellurian.

367.

368.

369.

370. Eighteen.

371.

372.

373.

374. Once in a lunation.

375.

376.

359. How much does the heliocentric place of the earth differ from the geocentric place of the ſun?

360. What are the Poles of the world?

361. What are the celeſtial poles?

362. What is the Terminator?

363. What is the cauſe of day and night?

364. What is the obliquity of the ecliptic?

365. How does the earth's axis move in all parts of the earth's annual orbit?

366. Explain the cauſe of the Four Seaſons of the year.

367. What is the ſituation of the equinoxial and ſolſtitial colours?

368. What is the ſenſible Horizon?

369. What is the rational?

370. Where is the boundary of Twilight or the Crepuſculum?

371. What is a periodical month?

372. What is a ſynodical month?

373. How do theſe differ, and why?

374. What is the motion of the moon round her axis?

375. What are the moon's Phaſes?

376. What is the moon's Diſc.

377.

378.

379.

380. Conjunction.

381.

382. Digits.

383.

384.

385.

377. What are the moon's Cuſps?
378. Why is there not an eclipſe at every Syzigie?
379. What are total eclipſes of the moon?
380. When do they happen?
381. What is a partial eclipſe?
382. How is the quantity of an eclipſe explained?
383. What is the Penumbra?
384. Why are ſolar eclipſes not ſo freqently ſeen as lunar?
385. Are ſolar eclipſes more frequent than lunar?

386.

387.

388.

389. Ninety degrees.

390.

391.

392.

393.

394.

395.

396.

397.

398.

399.

CHAPTER IX.

ASTRONOMY OF THE SPHERE.

386. WHAT is the artificial or armilliary ſphere?
387. What is a great circle?
388. What is a leſs circle?
389. What is the pole of a circle?
390. What is the axis of a circle?
391. What is the celeſtial axis?
392. What are the north and ſouth poles of the world?
393. What is the equinoxial or equator?
394. What are the meridians, hour-circles, circles of right aſcenſion, or circles of terreſtrial longitude?
395. What is the ecliptic?
396. What are the ſigns?
397. What are the cardinal points of the ecliptic?
398. What are the equinoxial points?
399. What are the ſolſtitial points?

400.
401.
402. From pole to pole, ecliptic.

403. From ecliptic.
404. From the equinox.
405. From aries.

406.
407. From the equinox.
408.
409.
410.

411.
412.
413.

414.
415.
416.
417. From the eaſt and weſt.

418.

400. What is the equinoxial colure?
401. What is the ſolſtitial colure?
402. What are the circles of celeſtial longitude?
403. What is celeſtial latitude?
404. What is terreſtrial latitude?
405. What is the longitude of celeſtial objects?
406. What is right aſcenſion?
407. What is declination?
408. What is the ecliptic obliquity?
409. What are the parallels of declination?
410. What is the Arctic circle, and how far is it from the poles and equinox?
411. What the Antartic?
412. What is the Zenith and Nadir?
413. What is the rational or celeſtial horizon?
414. What is the ſenſible or terreſtrial?
415. What is the riſing of a celeſtial object?
416. What the ſetting?
417. What are the Azimuth or vertical circles?
418. Which is the prime vertical?

419.

420.

421.
422.
423.
424. Meridian.
425.
426. The poles.
427. The equinox.
428.
429.
430.

431. From aries to horizon orient.
432.
433.
434.

435.
436.
437.

419. What is the amplitude of celeſtial objects

420. How does the azimuth differ from the amplitude?

421. What is the altitude of a celeſtial object?

422. What is the Zenith diſtance?

423. What is the meridian zenith diſtance?

424. What is the culminating of an object?

425. What are the Almacanthers?

426. What is a parallel ſphere?

427. What is a right ſphere?

428. What is an oblique ſphere?

429. What are the diurnal and nocturnal arcs?

430. What are the ſemi-diurnal and ſemi-nocturnal arcs?

431. What is the oblique aſcenſion?

432. What is the oblique deſcenſion?

433. What is the aſcenſional difference?

434. What is the latitude of a place on the earth?

435. What is the difference of latitude?

436. What is the longitude?

437. What is the difference of longitude?

438.

439.

440.

441.

442.

443.

444.

445. From equinox.

446.

447.

CHAPTER X.

GEOGRAPHY.

THE NATURAL AND POLITICAL DIVISIONS OF THE EARTH.

438. WHAT is the firſt natural diviſion of the earth?

439. How is land divided?

440. How is water divided?

441. What is a continent, iſland, peninſula, iſthmus, promontory, mountain.

442. What is an ocean, ſea, gulf, ſtrait, lake, river, creek?

443. How many continents are generally reckoned?

444. How many oceans are generally reckoned?

445 What is the ſituation of the northern Atlantic ocean?

446 What is the ſituation of the ſouthern Atlantic ocean?

447. How is the Pacific ocean ſituated?

448.

449.

450.

451.

452.

453.

454.

455.

456.

457.

458.

459.

448. Where is the Indian ocean?

449. Where is the Southern ocean?

450. In the political diviſions what do you mention firſt?

451. How is Europe bounded?

452. Give me the boundaries, chief towns, rivers, and mountains of England.

453. Do the ſame of Scotland, Ireland, France, Spain, Portugal, Holland, Netherlands, Switzerland, Germany, Hungary, Italy, Denmark, Norway, Sweden, Ruſſia, Poland, Turkey.

454. Give the ſame of Pruſſia, Bohemia, Sardinia, and the two Sicilies.

455. Which are the principal of the Britiſh Iſles?

456. Which, of the Spaniſh, Turkiſh, Italian, Swediſh, Daniſh, Azores Iſles.

457. What is the ſituation of the Mediterranean Sea?

458 What, of the Adriatic Sea, Euxine, White, Baltic, German.

459. What, of the Engliſh and St. George's Channels, the Iriſh Sea, and the Bay of Biſcay?

460.

461.

462.

463.

464.

465.

466.

467.

468.

460. What, of the Gulfs of Bothnia, Finland, Venice.

461. What are the boundaries of Aſia?

462. Give the boundaries, chief towns, rivers, and mountains of Siberia, Weſtern & Eaſtern Tartary.

463. Do the ſame of Kamſchatka, China, Cochin China, Tonkin, Laos, Camboida, Malaga, Siam, Pegu, Ava, Tibet, Indoſtan, Perſia, Arabia, Turkey in Aſia.

464. Give the boundaries, ſituation, and chief towns of the iſlands of Japan, Philippine, Chineſe, Molucco, and Sunda.

465. Give the ſituation of the Andaman, Nicobar, Maldive, and Ceylon Iſles.

466 What is the ſituation of the Caſpian, Korean, and the Yellow Sea?

467. What, of the Bays of Bengal and Siam, and the Gulphs of Tonkin and Perſia?

468. What are the boundaries of Africa?

469.

470.

471.

472.

473.

469. Give the boundaries, chief towns, rivers, and mountains of Morocco, Algiers, Biledugerid, Tripoli, Barca, Egypt, Nubia, Abyſſinia, Adel, Magadoxa, Caffreria, Monopotapa, Sofala, Hottentots, Lower Guinea, Upper Guinea, Zaara, Negroland, and Ethiopia.

470. Give the boundaries, ſituations, and chief towns of the Madeira Iſles, Canary Iſles, Cape Verd Iſles, Ethiopian Iſles, Socotora and Comoro iſles.

471. What is the ſituation of the Red and Moſambique Seas, and the Bay of Saldanna?

472. What are the boundaries of North America?

473. Give the boundaries, chief towns, and rivers of New Wales, New Britain, Canada, Nova Scotia, New England, the Jerſeys, Pennſylvania, Maryland, Virginia, Carolina, Georgia, Florida, Louiſiana, New Mexico, New Navarra, California, New Albion, and Old Mexico.

474.

475.

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477.

478.

474. What are the boundaries of South America?

475. Give the boundaries chief towns, and rivers of Terra Firma, Peru, Chili, Patagonia, La Plata, Paraguay, Braſil, Amazonia, and Guiana.

476. What is the ſituation of the Iſlands of Newfoundland and Cape Breton, Bermudas or Summer Iſles, Bahama Iſles, Great Antilles, (Cuba, Hiſpaniola, Jamaica, Caribbee Iſles,) Leſs Antilles, Terra del Fuego, and Gallipago Iſles.

477. What is the ſituation of Hudſon's Bay, Gulf of St. Lawrence, Fundy bay, the Gulf of Mexico, the Bay of Campeachy, the Bay of Honduras, the Bay of Panama, and the Caribbean Sea?

478. Which are the principal Iſlands in the Pacific Ocean?

479.
480. Zenith.

481.
482. Center.

483.
484.
485.

486.

487.
488. Latitude and longitude.

489. Loxodromic ſpirals.

490.

CHAPTER XI.

DESCRIPTION AND USE OF THE GLOBES.

479. WHAT is the Terreſtrial Globe?
480. Where is the eye always ſuppoſed to be placed on this globe?
481. What is the Celeſtial Globe?
482. Where is the eye ſuppoſed to be placed on this globe?
483. What is the uſe of the wooden horizon?
484. What is the uſe of the brazen meridian?
485. What is the uſe of the quadrant of altitude?
486. What is the uſe of the ſemicircle and its ſmall circle?
487. What is the uſe of the nautical box?
488. What is the uſe of the equator on the terreſtrial, and ecliptic on the celeſtial?
489. What are the rumb lines on the terreſtrial?
490. What are the arrows put for?

491. Poles in zenith and nadir.
492.
493. Poles in horizon.
494.
495.
496.
497. Same meridian, latitude S. as N.
598.
499. Oppoſite meridians, lat. ſame N. as S.
500.
501. Oppoſite meridians, oppoſite parallels.
502.
503. Torrid zone.
504. Frigid zone.
505. Temperate zones.
506.
507.
508.
509.
510.
511. Longeſt day, half hour different.

512. One month different.

491. What is a parallel ſphere?
492. What are the properties of this ſphere?
493. What is a right ſphere?
494. What are its properties?
495. What is an oblique ſphere?
496. What are the properties of it?
497. What are the Antoeci?
498. What are their properties?
499. What are the Periæci?
500. Tell their properties.
501. What are the Antipodes?
502. Give their properties.
503. What are the Amphiſcii?
504. What are the Periſcii?
505. What are the Heteroſcii?
506. What are the Zones?
507. Which is the Torrid, and why ſo called?
508. Which are the Frigid, and why?
509. What are the Temperate, and why?
510. What is a climate?
511. How do you point out the boundaries of climates?
512. How many climates are there between the equinox and arctic circle?

513.

514.

515.

516. Latitude 51° 30′ N. 40° 30′ S.—66° 30′ N. 23° 30′ S.

517. Latitude 51° 30′ N. 41° 0′ N.—23° 11′ N. 13° 5′ N.—Longitude 0° 0′ 29° 0′ E.—82° 18′ W. 80° 30′ E.

518. Latitude 40° 25′ N. 34° 35′ S.—38° 42′ N. 19° 30′ S.

519. Longitude 31° 30′ E. 71° 15′ W.—123° E. 87° 30′ W.

520. Both alike, ſubtract.—Both different, add.

521. As problem 5.

522. Latitude 53° 18′ N. 18° 19′ N. 64° 48′ N. Difference 4° 57′ S. 10° 44′ S. 13° 42′ S.

513. How many between the equinox and antarctic?

514. How many within the polar circles and their limits?

515. How many climates are there in all?

516. *Problem* 1. Given, latitude of any place.—Required, to rectify the globe.

517. *Problem* 2. Given, latitude and longitude.—Required, to find the place.

518. *Problem* 3. Given, latitude of any place.—Required, all places of the ſame latitude.

519. *Problem* 4. Given, the longitude of any place.—Required, all places having the ſame longitude.

520. *Problem* 5. Given, the latitudes of two places.—Required, the difference of latitude.

521. *Problem* 6. Given, the longitudes of two places.—Required, the difference of longitude.

522. Latitude of one place N.—Difference of latitude S.—How is the latitude of the other place found?

523. Latitude 42° 44′ N. 13° 37′ N. 17° 54′ N.
Differ. 13° 17′ N. 43° 39′ N. 8° 19′ N.

524. Latitude 39° 18′ S. 27° 18′ S. 44° 12′ S.
Differ. 17° 10′ S. 14° 49′ S. 9° 57′ S.

525. Latitude 42° 54′ S. 12° 17′ S. 8° 44′ S.
Differ. 19° 18′ N. 18° 44′ N. 19° 51′ N.

526. Longit. 18° 44′ E. 173° 17′ E. 163° 14′ E.
Differ. 9° 52′ E. 24° 56′ E. 59° 58′ E.

527. Longit. 48° 15′ E. 14° 53′ E. 42° 17′ E.
Diff. 17° 38′ W. 48° 17′ W. 74° 48′ W.

428. Longit. 74° 17′ W. 118° 54′ W. 164° 19′ W.
Diff. 8° 59′ W. 79° 14′ W. 76° 47′ W.

529. Longit. 13° 30′ W. 48° 19′ W. 12° 54′ W.
Diff. 19° 30′ E. 17° 38′ E. 49° 17′ E.

530. April 16, July 25, September. 10, January 30.

523. Latitude of one place N.—Difference of latitude N.—How is the latitude of the other place found?

524. Latitude of one place S.—Difference of latitude S.—How is the latitude of the other place found?

525. Latitude of one place S.—Difference of latitude N.—How is the latitude of the other place found?

526. Longitude of one place E.—Difference of longitude E.—How is the longitude of the other place found?

527. Longitude of one place E.—Difference of longitude W.—How is the longitude of the other place found?

528. Longitude of one place W.—Difference of longitude W.—How is the longitude of the other place found.

529. Longitude of one place W.—Difference of longitude E.—How is the longitude of the other place found?

530. *Problem* 7. Given, day of the month.—Required, the ſun's place in the ecliptic.

531. Aries 23°, Cancer 14°, Leo 28°, Scorpio 7°.

532. Latitude 51° 30' N. May 14.—Latitude 44° S. October 10.

533. January 14, March 16, June 23, October 26, January 19.

534. Latitude 51° 30' N. March 19.—Latitude 43° S. October 28.

535. Latitude 53° 37' N. alt. 64° 19' S.—Latitude 44° 17' N. alt. 35° 47' S.

536. Latitude 48° 57' N. day 3d March at 4 A. M.—Latitude 52° 18' N. day 17th October at 9 P. M.

537. Latitude 51° 30' N. alt. 25° 19' February 14.—Latitude 48° 19' N. alt. 53° 12' June 3.

538. Latitude 40° 15' N. October 9.—Latitude 37° 15' S. July 23.

531. *Problem* 8. Given, ſun's place in the ecliptic.—Required, the day of the month.

532 *Problem* 9. Given, latitude and day of the month.—Required, to rectify the globe.

533. *Problem* 10. Given, the day of the month.—Required, the ſun's declination.

534 *Problem* 11. Given, latitude and day of the month.—Required, the ſun's meridian altitude.

535. *Problem* 12. Given, latitude and ſun's meridian altitude.—Required, the day of the month.

536. *Problem* 13. Given, latitude and day of the month.—Required, the ſun's altitude at any hour.

537. *Problem* 14. Given, latitude, ſun's altitude, and day.—Required, the hour of the day.

538. *Problem* 15. Given, latitude and day of the month.—Required, ſun's riſing, ſetting, length of day, and night.

539. Latitude 58° 30' N. June 22.—Latitude 48° 17' S. September 12.

540. June 10, January 27, September 19, March 29.

541. Latitude 49° 45' N. October 31.—Latitude 49° 15' N. June 27.

542. Latitude and days as problem 18.

543. As problem 18.

544. Latitude 44° 18' N. Auguſt 18, at 4 P. M.—Latitude 56° 15' July 1, at 5 A. M.

545. Latitude 52° 45' N. azim. 20° S. May 14.—Latitude 42° 10' N. azim. 15° N. Auguſt 21.

546. Latitude 55° 14' N. April 16, at 9 A.M.—Latitude 54° 12' N. September 14, at 4 P. M.

539. *Problem* 16. Given, latitude and day of the month.—Required, the longeſt and ſhorteſt day.

540. *Problem* 17. Given, the day of the month.—Required, the ſun's right aſcenſion.

541. *Problem* 18. Given, latitude and day of the month.—Required, ſun's oblique aſcenſion and deſcenſion.

542. *Problem* 19. Given, Latitude and day of the month.—Required, the aſcenſional difference.

543. *Problem* 20. Given, latitude and day of the month.—Required, the ſun's amplitude.

544. *Problem* 21. Given, latitude, day, and hour.——Required, the ſun's azimuth.

545. *Problem* 22. Given, latitude, azimuth, and day.—Required, the hour of the day.

546. *Problem* 23. Given, latitude, day, and hour.—Required, the ſun's almacanther.

547. Latitude 53° 30′ N. January 30.—Latitude 42° 24′ S. Auguſt 10.

548. Latitude 62° 19′ N. May 19.—Latitude 24° 30′ S. September 10.

549. Latitude London, at 10 A. M.—Required the hour at Jamaica and Madraſs.

550. October 3, at 3 A. M. December 22, at 12. May 16, at 5 A. M.

551. London and Trinidad. Cadiz and Madeira. Breſt and Iceland.

552. Latitude 51° 30′ N. May 20.—Latitude 42° 18′ S. December 12.

553. Latitude 40° 20′ N. Longitude 18° 30′ E.—Lat. 24° 45′ S. Lon. 87° 20′ W.

554. March 10, at 8^h 19^m. Auguſt 26, at 14^h 27^m. December 15, at 19^h 37^m.

547. *Problem* 24. Given, latitude and day.—Required, another day of the ſame length.

548. *Problem* 25. Given, latitude and day of the month.—Required, the beginning and ending of crepuſculum.

549. *Problem* 26. Given, the hour where you are.—Required, the hour in any other part of the world.

550. *Problem* 27. Given, the day of the month and hour.—Required, where the ſun will be vertical.

551. *Problem* 28. Given, two places on the globe.—Required, their bearing and diſtance.

552. *Problem* 29. Given, latitude and day of the month.—Required, when the ſun will be due eaſt or weſt.

553. *Problem* 30. Given, latitude and longitude.—Required, the Antoeci, Periæci, and Antipodes?

554. *Problem* 31. Given, the time of an eclipſe.—Required, where it will be viſible.

555. $18^h\ 16^m$, $15^h\ 30^m$, $14^h\ 44^m$, $20^h\ 10^m$.

556. Two months. Two months, 15 days. Five months.

557.

558. Aldebaran, Sirius, Regulus, β Leonis, γ Scorpionis, δ Capricorni.

559. Latitude 51° 30′ N.—Stars in prob. 35.

560. Right aſc. 5^h, decl. 45° 45′ N.—Right aſc. $14^h\ 6^m$, decl. 20° 2′ N.

561. Latitude 40° 37′ N. Auguſt 15.—Latitude 53° 15′ N. December 15. Stars in problem 35.

562. Latitudes as problem 38. Stars in problem 35.

563. Latitude 51° 30′ N. May 27.—Latitude 24° 45′ S. December 10.

555. *Problem* 32. Given, the longeſt day of any place.—Required where the longeſt day ſhall be ſome hours longer.

556. *Problem* 33. Given, any time (not above ſix months.)—Required, where the ſun will not ſet for that time.

557. *Problem* 34. Given, the latitude 90°.—Required, the duration of twilight.

558. *Problem* 35. Given, any ſtar.—Required, its right aſcenſion and declination.

559. *Problem* 36. Given, latitude of a place.—Required, ſtar's oblique aſcenſion and deſcenſion.

560. *Problem* 37. Given, right aſcenſion and declination.—Required, the ſtar.

561. *Problem* 38. Given, latitude and day of the month.—Required, time of ſtar's riſing and ſetting.

562. *Problem* 39. Given, latitude of the place.—Required, any ſtar's viſible continuance.

563. *Problem.* 40. Given, latitude, day, times, noon, and midnight.—Required, the ſtars on or near the meridian.

564. Latitude as problem 40. Stars in problem 35.—Auguſt 10. at 8 P. M. February 21, at 4 A. M.

565. Latitude and day as problem 40.—Alt. of Aldebaran 20°. Alt. of Procyon 15°.

566. Latitude 51° 30′ N.—Latitude 42° 15′ S.

567. Latitude in problem 43.—Day and hour in problem 41.

568. April 15, Auguſt 18.—October 27, December 25.

569. Days as in problem 17.

570. Firſt magnitude 12°, 2d ditto 13°, 3d ditto 14°, 4th ditto 15°, &c.

571. Decl. 20° N. ſun Eaſt at 7 A. M.—Decl. 14° S. ſun W. at 5^h 30^m P. M.

564. *Problem* 41. Given, latitude, day, and hour of night.—Required, altitude and azimuth of any given ſtar.

565. *Problem* 42. Given, latitude, day, and altitude of any ſtar.—Required, the hour of the night.

566. *Problem* 43. Given, latitude of the place.—Required, the ſtars which never riſe nor ſet.

567. *Problem* 44. Given, latitude, day, and hour of night.—Required, the face of the heavens.

568. *Problem* 45. Given, the day of the month.—Required what ſtars riſe and ſet achronycally.

569. *Problem* 46. Given, the day of the month.—Required, what ſtars riſe and ſet coſmically.

570. *Problem* 47. Given, the day of the month.—Required, what ſtars riſe and ſet heliocally.

571. *Problem* 48. Given, ſun's declination, hour when due eaſt or weſt.—Required, the latitude of the place.

572. Decl. 18° N. azim. 25° N.—Decl. 14° S. azim. 10° S.

573. Alt. 30°, decl. 15° N.—Alt. 18° decl. 10°.

574. Decl. 14°, amp. 24° N.—Decl. 20° 10′, amp. 35° 38′ N.

575. Latitude 51° 30′ N.—Latitude 40° 15′ N.

576. Latitude as problem 52.

577. Latitude as problem 52.—Decl. 30° W.

578.

579.

572. *Problem* 49. Given, ſun's declination and azimuth at ſix.—Required, the latitude of the place.

573. *Problem* 50. Given, ſun's altitude eaſt or weſt and declination.—Required, the latitude of the place.

574. *Problem* 51. Given, ſun's declination and amplitude.—Required the latitude of the place.

575. *Problem* 52. Given, latitude of the place.—Required, the hour angles for an horizontal dial.

576. *Problem* 53. Given, latitude of the place.—Required, hour angles for an erect direct S. dial.

577. *Problem* 54. Given, latitude and erect plane's declination.——Required, the hour angles.

578. *Problem* 55. Given, the place of a planet.—Required, the time of its riſing, culminating, and ſetting.

579. *Problem* 56. Given, the node and inclination of the moon's orbit.—Required, an explanation of the phenomenon of the harveſt moon.

580.
581.

582.
583.
584. Sun riſing.

585. Sun ſetting.

586.

587. Midnight.

588.

589.

CHAPTER XII.

CHRONOLOGY.

THE PARTS OF TIME — ERAS — CYCLES — CALENDAR.

580. WHAT is Chronology?

581. What is the ſimpleſt general diviſion of time?

582. What is a natural day?

583. What, an artificial?

584. At what time do the Babylonians begin their day?

585. At what time did the Jews formerly begin their day?

586. What countries now begin their days as the Jews did?

587. At what time did the ancient Egyptians begin their day?

588. What countries now begin their days in the ſame manner?

589. At what time do the modern aſtronomers begin their day?

590.

591.
592.
593.
594.
595. Five days.
596.

597.
598. Twelve lunations.
599.

600.
601. Intercalary.
602.
603 Solar.
604. 4 by 365.

605.

606.
607.
608. 4 by 365. Sothis, Egyptian, Αϛροκύων.

590. What is meant by equinoxial or equal, and temporary or unequal hours?

591. What is meant by planetary hours?

592. What is a week?

593. What is a lunar and ſolar month?

594. How much do they differ?

595. What are the Egyptian Epogamenæ?

596. What are the periodical, and tropical or aſtronomical months?

597. What is a civil or political month?

598. What is the moveable lunar year?

599. How does the lunar year differ from the ſolar?

600. What countries obſerve the lunar year?

601. What is an embolimæan month?

602. How long is the lunar cycle?

603. What is the moveable Egyptian year?

604. How long is the beginning of this year in moving through all the ſeaſons?

605. What is the Julian, or our political year?

606. What is biſſextile, or leap year?

607. Why was the ſtile altered in 1752?

608. What, and how long is the great canicular year, or ſothiacal period?

609.
610.
611.
612.
613.
614.

615. At Dover Dwells George Brown Eſquire,
Good Chriſtian Finch, And David Friar.
616.
617.

618.

619.
620. Divide the year, and fourth of it by ſeven,
What left ſubtract from 7 the letters given.
621. Subtract one from the year, then uſe the
above rule.
622. Divide the year by 4, what left ſhall be
For leap year 0, for paſt, 1, 2, or 3.
623.

624.

609. What is meant by Epochs or Eras?

610. What is the Chriſtian era?

611. What is the Hegira of the Turks?

612. What is the era of the Creation?

613. What is the Calendar?

614. How is the diſtribution of days into weeks diſtinguiſhed?

615. How do you find the firſt letter for every month?

616. What is the Dominical letter?

617. Why has not every year the ſame dominical letters?

618. What is the motion of the dominical letter?

619. How do you prove it retrograde?

620. How is the dominical letter found for the 18th century?

621. How is it found for the 19th and 20th centuries?

622. How do you find what years are biſſextile?

623. How many dominical letters has leap year?

624. What part of the year is the firſt letter uſed?

625.

626.

627.

628.

629. When 1, 3, 9, to the year have added been,
Divide by 19, 28, 15.

630.

631. Mult. prime by 11, divide by 30; from rem. take 11, (borrowimg 30 where neceſſary;) this rem. gives the epact.

632.

Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sep.	Oct.	Nov.	Dec.
0.	2.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.

633.

634. Firſt Sunday after firſt full moon after 21st March, (or 20th in biſſextile.)

635. Moon's age multiply by 4, and divide
By 5, for ſouthing; add 3 for tide.

636.

625. What part of the calendar, the other?

626. What is the ſolar cycle?

627. What is the prime or golden number, lunar, or Metonic cycle?

628. What is the Roman indiction?

629. How are the lunar, ſolar, and indiction cycles found?

630. What is the Epact?

631. How is the epact found till the year 1900?

632. How is the moon's age found for any day of any month?

633. The day of the month of any year being given, how is the week day found?

634. How is Eaſter day found?

655. How is the moon's ſouthing, and high water at London bridge found?

636. Are the rules for finding the moon's age, ſouthing, and tide, exact?

637.

638. ὕδωρ αύλος.

639.

640.

641. 31 to 5.

642.

643.

644. Ordinate of ſemi-circle.

CHAPTER XIII.

HYDROSTATICS.

SPECIFIC GRAVITY.—TIDES.

637. WHAT is meant by Hydroſtatics?

638. What is meant by Hydraulic machines?

639. What do you mean by ſpecific gravity?

640. How is the ratio of the ſpecific gravities of bodies found?

641. Suppoſe a piece of lead and a piece of ivory to weigh 60 grains in air, and 55 and 29 in water, what are their ſpecific gravities?

642. How are the ſpecific gravities of liquids found?

643. If a piece of lead weigh in air 455 gr. in oil of vitriol 379, and in common water 414; what are the ſpecific gravities of the oil and water?

644. If a jet be cauſed by a ſuperincumbent liquid, through holes made in the ſide of a veſſel, how is the extent of the jet known?

645.

646.

647.

648.

649.

650.

651.

652.

653.

654.

655.

656.

645. How may the heavieſt bodies be made to ſwim in water?

646. What is the hydroſtatic paradox, and how is it explained?

647. What is the ſurface of a liquid contained in a veſſel?

648. If ſeveral tubes have a communication, to what height will a liquid riſe in each?

649. If two liquids of different ſpecific gravities be put together, what ſpace will each occupy?

650. Does the quantity of a liquid contribute to its preſſure?

651. Where will a body reſt that is heavier than a liquid, when immerſed in it?

652. Where, one that is lighter?

653. Where, one which has the ſame ſpecific gravity?

654. What weight does a liquid acquire which has a body immerſed in it?

655 How much of a liquid does a buoyant body diſplace?

656 Does the quantity of the liquid make any difference?

657.

658. Centrifugal.

659.

660.

661. Zenith and nadir.

662. Three boats.

663. The part of the earth directly under the moon, &c.

664.

665.

666. Sun and moon in conjunction and oppoſition.

667. Attraction of ſun and moon in oppoſition.

668. Moon in Perigæum.

657. Has gravity any effect upon liquids?

658. Why is the ſea higher at the equinox than at the poles of the earth?

659. Does the moon or the ſun counteract the force of gravity?

660. What is the conſequence?

661. Where is the effect of the moon's attraction the greateſt?

662. Give me a familiar example to illuſtrate the different attractive powers of the moon upon the zenith, center, and nadir.

663. What do you conclude from this example?

664. What part of the earth will have ebb or loweſt water?

665. Is the time of high water preciſely at the time of the moon's croſſing the meridian?

666. What are ſpring-tides, how cauſed, and how often do they happen?

667. What are the neap-tites, how cauſed, and how often do they happen?

668. What can cauſe the tides to be more encreaſed, cæteris paribus?

669. Greater circuit.

670.

671.

672.

673.

669. Why are ſpring-tides greater in March and September than any other times of the year?

670. Why are the tides higheſt near the equinox, and leaſt towards the poles?

671. Why have ſome inland ſeas little or no tides?

672. The whole earth conſidered, what is the general motion of the tides?

673. Illuſtrate the motion of the tides upon the Engliſh and Iriſh coaſts.

674.

675. Α'τμὸς σφαῖρα.

676.

677.

678. Rarifying and condenſing machines, barometer.

679. Fourteen pounds.

680.

681.

682.

683.

684.

685.

CHAPTER XIV.

AEROLOGY.

ATMOSPHERE, WINDS, METEORS.

674. WHAT is Air?
675. What is the Atmoſphere?
676. How do you prove air to be a fluid?
677. Why is the air ſo tranſparent?
678. How do you prove the air's gravity?

679. What is the preſſure of the atmoſphere upon one ſquare inch?
680. What is its preſſure upon a ſquare foot, and upon a man's body?
681. Why does this great preſſure not deſtroy animals?
682. Why are we more alert in fine clear weather?
683. Why more dull in rainy weather?
684. Why does water riſe in a common pump?
685. Explain the operation of a forcing pump.

686.

687.

688.

689.

690.
691.

692.
693. Air pump.
694.
695.
696.

697.

698.
699.
700.
701.
702. Near 14,000 times.
703. Into one-ſixtieth part.

686. What advantage has the latter over the former?

687. Upon what does the theory of fire engines depend?

688. Explain the principles of the ſteam engine.

689. Why does a liquid flow through a ſyphon?

690. What is the height of the atmoſphere?

691. From what height do we enjoy the benefit of its refracting power?

692. Is air neceſſary to life?

693. How is this proved?

694. Is its vivifying ſpirit neceſſary to fire?

695. Has air the power of a menſtruum?

696. What are the advantages which light derives from it?

697. Can the ſun be ſeen before he riſes, and after he is ſet?

698. How do you prove that?

699. Has the air gravity and elaſticity?

700. How do you prove its gravity?

701. How, its elaſticity?

702. How much may air be expanded?

703. How much may it be condenſed?

704.
705.

706.

707.

708.
709.
710.
711. Μετέωρον; from μετὰ and ἀειρω.
712.
713.
714.

715.
716.
717.
718.
719.
720.
721.
722.
723. Θαυμαντις.
724.

704. What is the cauſe of wind?

705. How many winds, with reſpect to the horizon, do mariners reckon?

706. What are conſtant, general, and liberal winds?

707. What is a breeze, a ſtiff gale, and a ſtorm?

708. With what velocity do winds move?

709. What are ſea and land breezes?

710. What are the monſoons?

711. What is a meteor?

712. What are fiery meteors?

713. What are watery meteors.

714. What are vapours and why do they aſcend?

715. What are fogs and miſts?

716. What are clouds?

717. What is the height of the clouds?

718. What is rain, and how produced?

719. What is ſnow—what hail?

720. What is lightning—what thunder?

721. What is the ignis fatuus?

722. What are the ſtellæ cadentes?

723. What is the rain-bow?

724. Why are there generally two bows?

725. 42° 2′.

726. 42° 17′.

727. 50° 42′.

728. 54° 22′.

729.

730.

731.
732.

733.

734.

735.
736. Παρὰ τον ἥλιον.
737. Παρὰ την σεληνην.

725. Under what angle is the higheſt inward part of the leſs bow ſeen?

726. Under what angle is the higheſt outward part?

727. Under what angle is the higheſt inward part ſeen of the external bow?

728. Under what angle is the higheſt outward part?

729. What is the altitude of the ſun when the bows are the completeſt poſſible?

730. What is his altitude when no bow can be ſeen?

731. Are rainbows formed in the clouds?

732. What is the reaſon of the colours of the bows.

733. Why are the colours in one bow in an inverſe order to the other?

734. Why do they always appear in that part of the heavens oppoſite to the ſun?

735. What is an halo?

736. What are the parhelia?

737. What are the paraſelenes?

THE END.